

School: SOE	Level: BE	Invigilator's Sign:
Program: BCE	Year/Part: III/II	Superintendent's Sign:
Subject: Water Supply Engineering (EG654CE)		Code No.

- i. Answers should be given by filling the Multiple-Choice Questions' Answer Sheet.
ii. The main answer sheet can be used for rough work.

Code No.

GROUP A (Multiple-Choice Questions)	[10x1=10]	Time: 20 Minutes
--	------------------	-------------------------

- Per capita water demand is calculated by:
 - Total annual consumption \times population
 - Average daily consumption \div population
 - Peak hourly demand \times design period
 - Fire demand + industrial demand
- Which disease is NOT water-related?
 - Cholera
 - Typhoid
 - Diabetes
 - Dysentery
- Which is the final step in water treatment?
 - Sedimentation
 - Filtration
 - Disinfection
 - Screening
- Which is a common O&M activity?
 - Designing new pipelines
 - Routine cleaning of reservoirs
 - Population forecasting
 - Conducting lab tests for pollutants
- EPANET software is used for:
 - Structural analysis of tanks
 - Hydraulic modeling of distribution networks
 - Population forecasting
 - Water quality laboratory analysis
- A community in Nepal's Terai region faces arsenic contamination. Which water source is LEAST suitable?
 - Deep tube well
 - Rainwater harvesting
 - River intake
 - Shallow aquifer
- Using the geometric growth method, forecast the population of a town (current population 50,000) after 20 years with a 2.5% annual growth rate.
 - 76,432
 - 81,930
 - 89,789
 - 95,000
- Which treatment is MOST effective for removing dissolved organic pollutants like pesticides?
 - Sedimentation
 - Chlorination
 - Activated carbon adsorption
 - Screening
- Which method is MOST cost-effective for detecting leaks in a distribution network?
 - Acoustic sensors
 - Pressure testing
 - Trench excavation
 - Satellite imaging
- High BOD in water indicates:
 - Low organic pollution
 - High dissolved oxygen
 - Presence of toxic metals
 - High microbial activity

Multiple Choice Questions' Answer Sheet

Marks Secured: _____

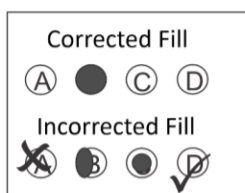
In Words: _____

Examiner's Sign: _____ Date: _____

Scrutinizer's Marks: _____

In Words: _____

Scrutinizer's Sign: _____ Date: _____



1. (A) (B) (C) (D)	6. (A) (B) (C) (D)
2. (A) (B) (C) (D)	7. (A) (B) (C) (D)
3. (A) (B) (C) (D)	8. (A) (B) (C) (D)
4. (A) (B) (C) (D)	9. (A) (B) (C) (D)
5. (A) (B) (C) (D)	10. (A) (B) (C) (D)

Manmohan Technical University
Office of the Controller of Examinations
Exam Year: 2082, Jestha (Model Question)

School: SOE	Level: BE	Time: 3 Hours
Program: BCE	Year/Part: III/II	Full Marks: 50
Subject: : Water Supply Engineering (EG654CE)		Pass Marks: 20

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ The figures in the margin indicate **Full Marks**.
- ✓ Assume suitable data if necessary.

GROUP A (Multiple-Choice Questions in separate paper)

[10×1=10]

GROUP B (Short Answer Questions - Attempt Any Eight Question)

[8×2=16]

1. A village in Nepal's mountainous region faces seasonal water scarcity. Propose a water supply system design considering local sources and challenges.
2. Compare surface water and groundwater sources in terms of advantages, limitations, and suitability for hilly regions like Nepal.
3. Describe the arithmetic and geometric methods for population forecasting. Which method is more suitable for rapidly growing urban areas in Nepal?
4. Explain the health impacts of contamination in groundwater, particularly in Nepal's Terai region.
5. Why is coagulation used in sedimentation? Explain about two common coagulants used.
6. Discuss the necessity of regular maintenance in water supply systems. Provide two examples of preventive maintenance activities.
7. The total hardness value obtained from the analysis of water sample is found to be 170 mg/l. The analysis further showed that the concentrations of all the three principal cations causing hardness are numerically same. If the value of carbonate hardness is 59 mg/l, calculate the following:
 - i. The value of non-carbonate hardness;
 - ii. The concentrations of principal cations; and
 - iii. The value of total alkalinity in mg/l.
8. A continuous flow sedimentation tank has dimensions of 60 m length and 3 m depth. The tank completely removes discrete particles of size 0.0025 cm and specific gravity of 2.65 at 20° C. Determine the flow velocity in the sedimentation tank.
9. A newly established town with a population of 1.5 million is to be supplied with water daily at 80 liters per head. The variation in demand is as follows:

<u>Time</u>	<u>Consumption in %</u>
5:00-10:00	45
10:00-14:00	10
14:00-18:00	25
18:00-22:00	15
22:00-5:00	5

Determine analytically the balancing reservoir capacity assuming pumping to be done at uniform rate and the period of pumping is 5 AM to 6 PM. Neglect fire demand.

P.T.O.

10. Estimate the total water requirement for a rural area for the year 2025 AD by forecasting the population by incremental increase method with the following data.

Year	1950	1960	1970	1980	1990	2000
Population	7150	7680	8425	9265	11780	14339

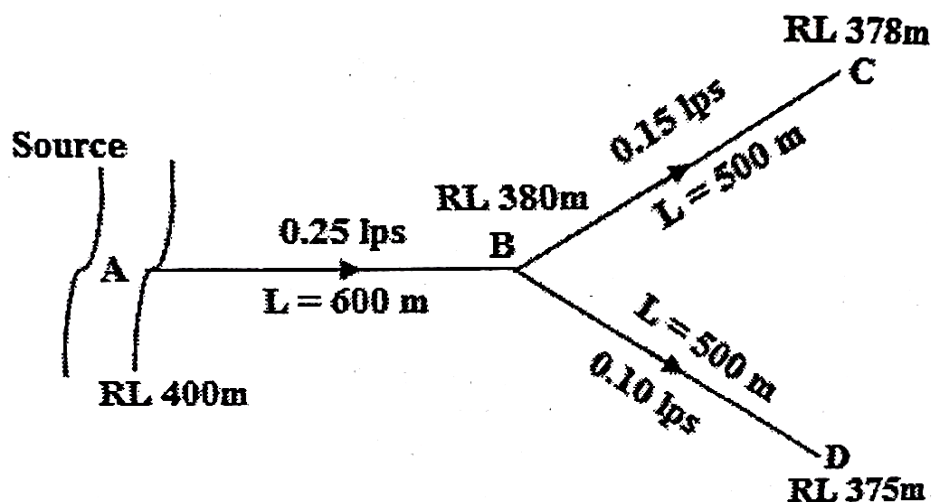
There are 6 schools with 250-day scholar students and staffs in each school, livestock (5520 chickens/ducks and 270 big animals), 3 health posts with 10 beds capacity and other offices with 705 staffs together.

11. Draw a typical flow diagrams of rural and urban water supply schemes showing the essential components. Discuss the function of each component.
12. The analysis of a sample of water showed the following results in mg/l.

Na⁺= 30.2, Mg⁺⁺=28.4 Ca⁺⁺=75 Ka⁺=32.9
Cl⁻=32.3 HCO₃⁻=120 SO₄⁻=52.8 NO₃⁻=12

The concentration of Strontium (Sr) is equivalent to hardness of 12.5 mg/l and the carbonate alkalinity in this water is zero. Calculate the carbonate hardness, non-carbonate hardness and total hardness. Also, suggest different methods for the removal of hardness caused by these ions.

13. Determine the settling velocity of a discrete particles having the diameter of 0.11 mm and specific gravity of 2.60 in water. The temperature of fluid is 21° C. Assume necessary data suitably. (Kinematic viscosity=0.985 centistokes)
14. Average water consumption rate is 110 lps in an urban area. Design a rapid sand filtration unit for a community having the population of 5550. Assume necessary data suitably.
15. A layout of rural water distribution system is shown below. Design pipes AB, BC, and BD. Assume Hazen William's coefficient C=100. A minimum pressure of 1.0 kg/cm² is to be maintained at all the points in the pipeline.



16. Explain in brief the theory of disinfection by chlorine.

**** The End ****